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TECHNOLOGY AND THE MILITARY REFORM DEBATE

Kevin N. Lewis

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The Rand Corporation, Washington D.C. [*]

Technological developments have always exerted a powerful influence on the way that military organizations have gone about their business. In this regard, the two global wars of this century have formed an important historical watershed. We are led to believe that in the old days peacetime military organizations often failed to take advantage of new technological opportunities (and in some instances actively worked to suppress technological advances that threatened the status quo). But the twentieth century has seen the evolution of quite a different approach to the development and application of new technology for military purposes. Most military experts now agree that the development of new technology must be encouraged, and occasionally forced along, in the interests of national security.[1]

In the United States, military investment (spending on research and development, modernization, and force structure expansion) typically represents half of our defense budget--and the lion's share goes toward

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[1] Even if we conclude that the pursuit of a certain technology will pay no dividends, we may still be obliged to explore such possibilities for a number of reasons--in particular so that we can assess the military implications of that technology should the enemy choose to exploit it.

the development or procurement of systems that can be characterized as technologically advanced. In addition, civilian and private-sector R&D enterprises often yield crucial military spin-offs. By contrast, the Soviets are believed to spend perhaps twice what we do to modernize and expand their forces and to create additional options for the future.

Given the large sums involved, the fact that technological advances can have important organizational and strategic ramifications, and the consequences for deterrence should we fail to maintain a technologically competitive position vis-a-vis determined adversaries, it is not surprising that raising questions related to the military use of technology should frequently lead to intense debate. Many issues have been discussed, including technology's alleged tendency to spawn wasteful arms races, the adverse economic effects of diverting personnel and resources from civilian to military efforts, and the degree to which technological advance stimulates changes in existing strategy, tactics, and doctrine. Over the past few years, however, a new topic has arisen that is now of particular importance: namely, whether we are using technology (in our weapons and in the force structure as a whole) in an appropriate way. In other words, are we buying and maintaining the appropriate capabilities, and fielding them in the right numbers and dispositions, to support our national aims adequately?

Short of a major conflict which would put our people, machines, and employment concepts to the acid test, there seems to be no way to "prove" in advance whether or not our design and doctrinal assumptions are correct. Indeed, the fact that the many opposed sides in heated national security debates frequently use the same bits of evidence to support their cases indicates a few disturbing things.[2] First,

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[2] For example, the alleged "lessons" of such recent conflicts as

deliberately manipulating the significance of technological developments is one popular technique for furthering parochial interests. Second, reliable interpretation of the military significance of technological developments is often frustrated by the enormously complex way a number of factors (many of them intangible ones, like morale, quality of leadership and training, and even luck) combine to produce military outcomes. Third, it would seem that our inability to come to some general consensus about how to assess and use technology is explained in part by the existence of very different views about the best way to accomplish military objectives. For these and other reasons, it is quite unlikely that we will ever know with much certainty whether we are spending too much or too little on the development of new capabilities, and whether we can offset potential enemy scientific breakthroughs.

It is against this backdrop that the current military reform debate should be viewed. As has been pointed out so many times, the "military reform debate" often amounts to a virtual grab bag of interests and pursuits, some of which are confused, internally inconsistent, and/or have little to do with national security. Despite oversimplifications, dubious analysis, partisan hype, and other irrelevant ideological fulminations,[3] one can discern two lines of argument regarding our

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the Falklands/Malvinas campaign and the Israeli/Syrian engagements in Lebanon have been thrown about in support of categorically opposed arguments in a number of debates addressing, among other things, the role and nature of carrier-based aviation, the need for more or for fewer surface ships, the relative advantages of training, tactics, and numbers in air combat, and many others.

[3] The extreme nature of many allegations helps to eclipse the valid points that are made by both sides. Reports about altimeters designed to run 200 feet underwater, the $500 washer, and the guy in the missile unit whose job it is to "hold the horses" sell newspapers but do little to inform reasonable debate on important national security issues.

historic approach to the technological aspects of weapon and total force posture design.

One side of the debate, the reform argument, contends that weapon and posture design trends have gone awry in recent years; as one author suggests, a misguided "cult of procurement" has sprung up that foolishly chases "magic weapons."[4] The reformers believe that, for a number of reasons, the pursuit of technological innovation as currently practiced results in an increasingly inefficient and incapable military:

1. Greater sophistication in weapons design drives up the cost of our military hardware; therefore, fewer and fewer weapons are procured over time. Given the current and probable future size and mix of defense budgets, we may in fact field too few weapons to mount an effective defense.[5]

2. Similarly, the complexity of the systems we do procure makes for RAM (reliability, availability, maintainability) headaches. More complex weapons also may require higher-quality and,

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[4] James Fallows characterized the weapons acquisition process in this way in his National Defense, New York: Random House, 1981, and in "America's High Tech Weaponry," Atlantic, May 1981. The expression "More Bucks, Less Bang" is the title of an anthology of weapons "horror stories" compiled by the Project on Military Procurement; More Bucks, Less Bangs; How The Pentagon Buys Ineffective Weapons, ed. Dina Rasor, Washington, 1983. The latter volume conveys the picture of a military machine in which literally no advanced weapon the United States has recently bought works.

[5] Depending on the specifics of the case in question, classes of weapons have tended to become more expensive on a unit basis over time; a "modernization inflation" rate of some 3-6 per cent a year is commonly cited. There are many reasons for the steady increase in cost over time; among them are deliberate design choices, the incorporation of expanded capabilities for dealing with new kinds of threats, smaller production runs, and the deteriorating health of the defense industrial base.

therefore, increasingly expensive personnel for their maintenance and operation.

3. Even if advanced technology weapons do perform as advertised, the irresistible force of sheer numbers can still defeat them. For example, although advanced aircraft might defeat less capable ones in one-on-one combat, superior numbers of aircraft tend to prevail in many vs. many dogfights.

4. Some kinds of advanced technological capabilities may even be hazardous to the health of those who rely on them. Since surprise is so important in aerial engagements, for instance, searching for or shooting at an enemy with a long-range tracking or target-illumination radar alerts everyone to a fighter's whereabouts and, according to this view, places that aircraft in jeopardy unnecessarily.

5. In general, the technologies we pursue have already been pushed so far up various curves of diminishing marginal returns that relatively large increases in spending will yield only modest increases in performance.

6. The allure and cost of fancy gadgets perverts the acquisition process itself. Mistaken technological expectations and spiraling costs are said to tempt us to avoid clearly defining requirements, sticking to sound acquisition plans, realistically testing weapons, and training our soldiers, sailors, and airmen in their proper use.

7. Because of the delays involved in bringing "gee-whiz" systems to maturity, the United States loses a golden opportunity for achieving a technical lead over the qualitatively inferior (but

apparently more efficient, at least when it comes to getting deadly hardware in the field) Soviet military apparatus.

The heart of the reform argument, therefore, is that the pursuit of complicated, unreliable, and expensive weapons results in our buying "fewer bangs for more bucks." The other side of this debate, which might be termed the "establishment" view, asserts that an emphasis on technological development is, for many reasons, essential to maintaining an effective defense:

1. Technology acts as a crucial force multiplier. Because of asymmetrical resource and political constraints, the United States must maintain a qualitative lead if it is to deal with quantitatively superior adversaries. (Because of the low cost of their manpower—Soviet conscripts earn about $10 a month— and the relative stability of their defense planning system from year to year, the Soviets are able to spend twice as much as we do on hardware.) In particular, we might use technology to whittle numerically superior threats down to the point where the enemy cannot overwhelm our forces. Thus, beyond visual range (BVR) radar guided missiles like SPARROW and its successor (AMRAAM, now in development), would cut Soviet fighter waves down to size before dogfighting could begin, and advanced air- and ground-to-ground munitions (including cruise and ballistic missile concepts such as MRASM and JTACMS) could attrit Soviet follow-on ground force echelons while NATO's front line forces blunted the leading formations of a Soviet armored thrust.

2. The financial costs and political liabilities and uncertainties of overseas bases, highly trained manpower, and so on also force us to pursue qualitative improvements, since even if we had a force structure that included larger numbers of the less complex and costly systems that some reformers have advocated, we could not afford to man, train, or deploy them (except by resorting to conscription, a very low readiness/maximal "rubber on the ramp" procurement budgeting strategy, and other equally undesirable and unfeasible approaches).

3. Given the broad range of possible scenarios that we might face and the fact that the enemy has the advantage of the initiative in any decision to launch an attack, we need a _flexible_ posture—and technologically sophisticated weapons are in many cases the proper means to this crucial end.

4. The nature of the threats before us may also require a greater degree of performance and hence technological sophistication. For example, if the Soviets plan to fight at night or under any weather conditions, we must react accordingly.

5. The strategic relationship between the United States and some of its allies is such that the United States would often provide the bulk of technologically advanced materiel support.

6. It is also possible that some of the Soviet systems we may confront are anything but simple, "throw away," low mix ones themselves.[6]

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[6] The popular impression that the Soviets build cheap, simple, austere weapons because they either simply cannot match U.S. technology or have come to the conclusion that "simpler is better" is wrong. There is nothing simple or austere about such Soviet systems as the Flogger tactical aircraft, Alpha attack submarine, and T-72 tank. See William

7. Finally, some technologies (particularly semiconductor and other computer- and sensor-related ones) have fantastic growth potential and may lead to higher reliability, reduced manpower and training costs, and so on.[7]

These lists outline the central points raised in the reform debate, at least insofar as technology is concerned. Two factors make it highly unlikely that either side could ever be judged the outright winner. First, both sides' claims contain elements of truth--how the different assertions should be weighed will probably be decided on the basis of the specifics of the case in question. Second, both sides of the debate at times address virtually all aspects of the total defense planning problem. The problem of how to use technology is related to such fundamental points as: assumptions about the relative likelihood of particular kinds of wars; an image of how those wars would be fought; the role to be played by allies; the possible timing of a crisis and conflict (and accordingly, assumptions about readiness, mobilization,

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Perry, "Fallows' Fallacies," International Security, Spring 1982, pp. 174-82, and and Fred Kaplan, "Soviets Adopting U.S. Trend Toward Complex Weaponry," Boston Globe, June 26, 1983, p. 10.

[7] For example, simulators provide excellent flight training at just a fraction of the costs of actual flying (in terms of fuel burned, maintenance hours, and aircraft and crews lost in accidents). Similarly, the installation of modular or "black box" equipment in weapons effectively transfers the burden of complex maintenance from dispersed front-line users to concentrated and more efficient depot-based personnel and equipment, often at a significantly reduced overall cost. However, it should be noted that with this efficiency come a number of potential wartime problems. For example, F-15 avionics maintenance has been centralized to some degree; this saves money, but makes the destruction of maintenance facilities relatively more catastrophic in wartime. No one would claim that the USAF should be run like Eastern Airlines, but at the same time it is very difficult to balance uncertain wartime requirements against a very powerful pressure to save money on a day to day basis.

the need to prepare for simultaneous contingencies, the role to be played by escalatory threats, etc.); and other very important matters.

It would be interesting to try to address in detail the problem of national security planning "from the top down." Unfortunately, we must make many near term decisions about the use of technology that cannot be postponed until after a grand philosophical debate. Some of the capabilities in question--like those required for the futuristic strategic defense initiative dubbed "Star Wars" and the new program of "enhanced technologies" (known as "E.T.") for precisely delivered, conventional attacks against Soviet follow-on echelons and other r te targets--place a very heavy emphasis on the use of advanced technologies. Our immediate decisions about these and other programs could have enormous financial and strategic repercussions for decades to come.

Because we are staking so much on advanced defense technologies, it is essential to determine what aspects of our traditional approach to the military use of technology work well and in what areas reforms are needed. It is probable that even quite modest improvements in assessing and applying often uncertain new technologies could pay very attractive dividends. I could suggest many areas of improvement, but will limit my discussion here to three general areas where progress can be made toward the better use of technology: resolution of genuine disagreements about the priority of particular missions; balancing the need for total force flexibility against the efficiency of specialized system design; and coping with the "dynamic aspect" of weapons design.

What missions, what priorities? Defense planners must realize that short of mobilization for general war, we cannot afford the force

structure needed to deal simultaneously with all possible threats to our interests with what would pass for high confidence. While we can rely to some degree on strategic mobility and central force reserves, allied contributions, and the like as a substitute for in-hand force structure, difficult posture tradeoffs must nonetheless be made. Many factors (some of them not related to defense at all) influence our determinations about which risks are most grave and what contingencies should be ranked most highly when it comes to the allocation of resources. Although we cannot control all of the pertinent variables, we are well-advised to be as consistent as possible in our planning—for instance, Army and Air Force assumptions about how long a European war would last before going nuclear should not be wildly different. In preparing guidance for the planners charged with designing our force structure, then, it seems clear that the weapons systems that we procure should reflect the relative priorities of possible missions as these are stated in our overall military concept. Only in this way will our broad strategic choices shape our force structure, as opposed to allowing the systems we buy to drive our employment doctrine. Unfortunately, the reverse process is more often seen than not: important strategic questions are often raised after key development and procurement decisions are made (if they are raised at all).

The need to clarify the issues involved in designing operational requirements is illustrated by an ongoing and quite acrimonious debate that has accompanied the design and production of several, but in particular the current, generation of U.S. tactical fighters. This controversy is based on nothing less than a fundamental difference of opinion concerning the characteristics of a future air war, and on the role of aviation in best supporting U.S. aims in such a war.[8] One

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[8] Tactical aircraft programs figure prominently in the reform

school of thought has emphasized demanding air superiority and deep strike missions. If we are to accomplish difficult combat tasks and survive in an extremely hostile environment, certain technical features should be built into aircraft, including speed (with afterburner) in the Mach 1.5-2.5 range, BVR missile engagement capabilities, sophisticated avionics for navigation and weapons delivery, the electronic countermeasures (ECM), "identification friend or foe" (IFF), and communications gear needed for survival and coordination, possibly a second crew member to handle extra flight duties, and so forth. The result is a large aircraft (empty weight of 30-50,000 pounds).

In contrast to this admittedly oversimplified statement of mission requirements is a philosophy that advocates an altogether different approach: namely, the achievement of air superiority by success in close-in air combat. Here, the capabilities prized by the first group can actually be counterproductive. Since perhaps 80 per cent of the aircraft shot down in air-to-air combat never see the enemy who does them in, design characteristics and tactics that minimize the overall signature of the aircraft (i.e., small size, minimal radar or ECM emissions, and so forth) are essential. Moreover, based on such analytic inputs as classical mathematical models of engagement (such as Lanchester equations), the statistical results of tests and simulations

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debate primarily because they are so expensive on a unit basis and because when aircraft are designed, making changes in one attribute can force dramatic changes in other features of the airplane. For instance, to increase the speed of an aircraft to improve its effectiveness in air-to-air combat may also increase the rate at which fuel is burned; for a fixed range requirement, this translates to more internal or outboard fuel carriage, which in turn increases the aircraft's size, which has its own implications for the aircraft's performance in combat, and so on.

(such as the AIMVAL/ACEVAL air combat tests), and, to the extent that useful parallels can be drawn, wartime experience, a case can be made that aerial victory would go to the side fielding disproportionately more fighters, regardless of the relative one-on-one performance advantage of fancier aircraft. Taking these factors into account, the ideal aircraft would be much smaller (in the 10-15,000 pound class).

It is not difficult to imagine scenarios or interpret available data in such a way that either side's contentions seem correct. The point, however, is that _many_ scenarios are possible, and there is no reason to suppose that the few selected for planning purposes are very much more likely than other possible cases. Indeed, it is also conceivable that the character of an air war could change substantially during the course of fighting and therefore demand different kinds of capabilities over time. Given tight budgets and the nature of the threats before us, it would seem prudent to prepare for a broad range of possible contingencies of widely differing character. Thus, a mix of several types of aircraft (possibly including so-called swing forces)[9] might be the best bet. But how we determine the appropriate mix of system characteristics and total posture capabilities depends on how we resolve debates on the relative priority of different missions. A reasoned assessment of these issues would pay substantial dividends, whereas a continued focus on the merits or liabilities of individual systems will at best accomplish nothing, and will at worst conceal legitimate doctrinal disputes.

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[9] Swing forces refers to those multimission systems that are assigned to varying tasks depending on the specifics of the scenario; for example, F-16 fighters would initially be assigned an air defense role. As the overall aerial threat waned and as enemy air defenses deteriorated, these aircraft would gradually be reassigned to ground-attack missions.

In short, we should consider the reasons for adopting certain design features before we start bending metal. The important judgments to make are whether our operational concepts are flawed and whether our allocation of resources among many possible missions is out of balance. This must be done before resource allocation decisions are made and must reflect the realities of the budget and of the threats we may face.

Most systems must perform several jobs. Despite assertions to the contrary, the United States buys few systems that are truly specialized (in the sense that the weapon is intended only for use in one situation, or in one region, at one point in time).[10] Designing weapons with a potential for multiple uses, however, often has significant implications for the use of military technology. Given a fixed budget, we must tolerate--within reasonable limits--the degradation of certain capabilities in favor of accommodating multi-role potential. As with mission priorities, however, some camps in the reform debate try to have it both ways. For instance, systems and the acquisition process are criticized either because weapons either are not optimized for all conceivable roles or because we have, as it is usually put, tried to do too much with one piece of hardware. The national security debate would probably be more productive if everyone would keep in mind the tradeoffs involved in a weapon's design.

The Perry-class guided missile frigate, for example, has been criticized as inadequate as a task force escort. This is hardly surprising, since they were not designed for such a role. Rather, they

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[10] Some systems are obviously more appropriate for certain missions than others, at least in relative terms; moreover, some multimission systems would be so valuable in a particular role that they would not ordinarily be used in other capacities.

have been pressed into this kind of duty because there are not enough

destroyers to do the job. The lesson of this is not that Perry-class

ships are somehow useless, it is that we need more destroyers for

carrier battle group operations. Refocusing the debate in this way

might help to ensure that the cost of a new class of destroyers remains

under control, so that sufficient numbers of battle group escorts can be

bought. (The currently planned guided missile destroyer, the DDG-51

Burke-class, strikingly resembles the expensive Ticonderoga-class

cruiser and may cost at least half again as much as the most recent

class of destroyers.)

A second example of the tendency for the reform debate to lose

perspective is the much-maligned F/A-18 fighter. To be sure, the Hornet

does not, in some scenarios, perform some missions as well as aircraft

that were designed specifically for those purposes--but again, that

isn't the point. Rather, one sacrifices some degree of performance in

some scenarios for the sake of such hard-to-quantify benefits as having

aircraft flexible enough to be reassigned from one role to another as

required by the contingency at hand, gaining efficiency from having one,

instead of several types of, planes aboard a carrier, and satisfying

unique carrier environmental requirements (which could have an adverse

effect on performance or cost such as maximizing the number of deck

spots, having two engines for safety's sake, and so forth).

Conversely, we can go too far in our attempts to build systems for

multiple roles, especially when we are designing systems at the high end

of the force inventory. The billion-dollar-a-copy Ticonderoga-class

guided missile cruiser is a good example. This cruiser, with its

sophisticated Aegis air defense system, is intended to defend carrier

task forces primarily against bomber and cruise missile attack. But
during the design process, extra capabilities were added to the ship
that seem incompatible with the overall design philosophy.[11] Another
example is the Los Angeles-class attack submarine; here, part of the
high cost of this system can be attributed to the requirement that this
kind of submarine be able to keep up with a carrier task force. Direct
support of carriers by nuclear powered attack submarines is important,
of course, but the entire sub fleet need not have this capability.
Given the potential of modern submarine-mounted sonars and smart anti-
submarine standoff weapons, it may not be necessary to build thirty-
plus-knot performance into an unnecessarily large follow-on nuclear
attack submarine class.[12]

In short, we have to strike some kind of balance between expecting
too much from deliberately constrained systems and trying too hard to
build systems that can accomplish several demanding missions equally
well. Determining where to draw the line is an inevitably controversial
process that requires careful case-by-case analysis. But for the sake
of improving the reform debate, more attention should be paid to the
underlying reasons for making design tradeoffs.

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[11] For example, the Ticonderoga/Aegis cruisers mount two five
inch guns. Ordinarily, naval gunfire is appropriate for such tasks as
the support of amphibious operations or close-in combat with less than
all-out threats. It is hard to imagine either that one of these ships
would be assigned to such a role (given the much higher priority mission
of carrier defense), or that a carrier battle group would find itself in
a situation in which gunfire from its chief missile escort would be
critical.

[12] It has been reported that the Navy is considering, as a follow-
on to the Los Angeles-class attack submarine, a new design that "will be
far larger" than the SSN-688 class--and about twice as expensive, too.
See Dave Griffiths, "New Attack Submarines: 30 Boats for $36 Billion,"
Defense Week, July 5, 1983, p. 1.

The dynamic aspects of system acquisition. Debate on the appropriate use of advanced military technology frequently raises questions about when capabilities might be incorporated into the force structure. Over the past decade or two, at least five factors have combined to change the environment in which we must view our force design in this respect:

1. As technological possibilities expand and individual unit costs rise, systems have tended to take more time to design, are produced less quickly over a longer period of time, and remain in the inventory longer.

2. Technological progress may occur irregularly—for instance, important developments in jet engines will not coincide with avionics, munitions, or air vehicle advances, and so on. Moreover, when it has come to our ability to accurately predict such developments (or to integrate technology so as to take full advantage of them) our track record is not necessarily something to be very proud of.

3. The sophistication and character of the threat (and just as important, its vulnerabilities) will change over time, often in unexpected ways. In addition, political and other developments will often change the planning context for a new program (when it comes to basing access and other important issues, for instance).

4. Our long-term force plans are constantly disrupted and even overthrown, affecting our decisions on what capabilities to incorporate into a system (say, to hedge against certain funding setbacks).[13] In addition, our defense budget process

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[13] Take, for an example, the task of providing quick-reacting air-

encourages the deferral of certain kinds of costs to future

budget cycles, again with important implications for our

posture design process.

5. For political, budgetary, and other reasons, fewer weapons

programs will be started over time.[14]

This changing technical and operational environment forces us to

make some important tradeoffs at an early stage in weapons design. On

the one hand, there is an understandable tendency to "go for it" when it

comes to incorporating sophisticated new technologies into weapons. On

the other hand, we have not always been successful when it comes to

reading the risks involved in pushing the frontiers of military

technology forward, and we are well advised to freeze a system's design

before beginning full-scale production (since changing the

specifications of weapons or going ahead with production while

concurrently finishing program development often leads to increased

costs, less than ideal performance, inadequate weapon RAM, and delays in

the fielding of weapons). What is needed, then, are management

strategies that can help us develop technologies in a timely, yet at the

same time, low risk fashion.

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to-ground fire support for our front line troops. Here Army helicopter
and Air Force attack aircraft programs could conceivably be planned so
that the various attack assets available would play complementary roles.
But if for budgetary or other reasons either service failed to deploy
the planned force structure, then some kind of ad hoc compensation would
be needed.

[14] In this regard, new kinds of restraints are influencing the
form that new starts take. Consider tactical aircraft: the need for
some manufacturers to balance civilian with military efforts for the
sake of corporate stability, the need to collaborate with other nations
if not one's sister service on a program, the advantages for one's
program of a successful foreign sales program, and other factors may
play a very powerful role in shaping our military modernization
activities.

A number of such approaches have so far been advocated, including weapons prototyping and preplanned product improvement (P3I), one of the centerpieces of the so-called Carlucci acquisition reform initiatives.[15] P3I is particularly interesting, since its emphasis on putting new technologies in the field faster and anticipating modernization of deployed forces at relatively low cost over the extended lifetime of the system presumably would keep us from having to force or forsake altogether promising technological possibilities. Unfortunately, just as we cannot always assess new technologies well as we begin designing a system, so we cannot be sure what kinds of improvements we might want to make in systems in another decade or two. Moreover, there is no guarantee that we would undertake system improvements even if we had correctly planned for them.[16] This does not rule out the possibility for "nonpreplanned" modifications of systems--the Air Force and Navy's F-4 versions and the M-60 tank have done very well in this regard over time. However, it is not clear how we can assure in advance such success in new programs or how far we can take program modifications.[17]

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[15] The Carlucci initiatives (after the former Deputy Defense Secretary Frank Carlucci) was an ambitious, and if certain obstacles can be overcome, high payoff attempt to deal with a number of defense procurement problems.

[16] A key example here is the failure, at least so far, to proceed with "preplanned" F-14 engine and avionics modifications.

[17] Eventually, all systems will simply run dry when it comes to further modifications. A striking case in point concerns U.S. strategic offensive forces. For twenty years we have modified the various legs of the Triad at the margin in order to keep up with changing operational requirements and threats. But the slack in these versatile systems has been more or less expended: this is one of the major reasons behind the current requirement to simultaneously modernize all three elements of the nuclear forces.

One way to guard against failure to develop technology
appropriately for combat systems is to pursue several possibilities when
we decide to modernize a particular part of our force. In this way we
retain options--we do not wind up empty-handed if we are forced to
cancel programs because certain technology gambles have not panned out.
To be sure, this approach may require us to spend more up front, and
this might sometimes result in increased political opposition. But it
is possible that multiple options, and in some cases competition,
between candidate systems, would help to deliver higher quality weapons
sooner; moreover, the extra front-end costs of multiple or competitive
development may not be prohibitive (and hedging and competition in some
cases may even save us money in the long run). This certainly has been
the case in such programs as the Lightweight Fighter, the A-X close air
support aircraft, and the Advanced Attack Helicopter. By contrast, the
absence of options has contributed to some noteworthy acquisition
disasters--for instance, two candidate follow-on tanks to the M-60 (the
MBT-70 and the XM-803).[18]

In sum, concealed in the rhetoric of the reform debate is an
important question: are we using technology in military systems in an
appropriate way? Some of the most important determinants of design
success--the effect of political pressures on weapons programs chief
among them--have not been discussed here because there is probably
little we can do about them.[19] Nonetheless, there are a few steps we

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[18] Note that the relative lack of options and/or competition in
these cases was not the only factor involved.

[19] For instance, the Pershing II has performed less than
outstandingly in its test program not because of any design flaw or
acquisition failure, but rather because of the need to deploy the
missile on a tight schedule determined by political factors.

can take to improve our ability to get the most from our military technologies. I have listed three possible measures here. What technological capabilities to build into a given system probably has to be decided on a case-by-case basis, but speaking generally, if we can conduct productive debates on operational concepts and doctrine, keep operational tradeoffs in mind, and introduce more flexibility and competition into our acquisition planning process, we can expect at least slightly better decisions about what technologies are appropriate for a particular weapon and when to incorporate them.

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